REMARKS

Entry of the foregoing, reexamination and reconsideration of the subject application are respectfully requested in light of the amendments above and the comments which follow.

It was noted at item no. 4 of the Office Action Summary that claims 1-64 were pending. This is incorrect. Claims 1-70 were pending in the present application. Claims 65-70, while being withdraw as allegedly corresponding to a non-elected invention, are nonetheless pending claims. By the present response, claims 1, 32, 33, 36-38, 49, 51-53 and 61 have been amended. Claims 31 and 42 have been canceled. Claim 71 has been added. Thus, upon entry of the present response, claims 1-30, 32-41, 43-64 and 71 are pending and await further consideration on the merits. Claims 65-70 have been withdrawn from further consideration.

CLAIM REJECTIONS UNDER 35 U.S.C. §112

Claims 36-38 stand rejected under 35 U.S.C. §112, first paragraph on the grounds set forth on page 2 of the Official Action. This rejection is respectfully traversed. In the grounds for rejection it is alleged that: "The composition A_XC where $X = 0$ to 1 is viewed as both inconsistent with the disclosure and impossible." This assertion is clearly incorrect. First, applicant does not believe that the statement is inconsistent with the original disclosure. Second, if $X = 0$, then arguably, no foreign species would be present within the nanostructure, thus representing a construction which is clearly possible (e.g. - a "pure" carbon nanotube).

Moreover, the specification and claims have been amended in a manner which is believed to address any concerns which may have prompted the above-noted grounds for rejection.

Claims 31-33 stand rejected under 35 U.S.C. §112, second paragraph on the grounds set forth on page 3 of the Official action. This rejection is respectfully traversed.

In the grounds for rejection, it is alleged that the limitation "passivation layers" is indefinite and unclear. Applicant traverses this assertion.

First, it should be noted that the claims are not to be read in isolation. Rather, the claims are to be read in light of the total disclosure, including the specification, and through the eyes of those of one of ordinary skill in the art. When properly interpreted, the limitation "passivation layers" is readily understandable to those of ordinary skill in the art.

As claim 31 has been canceled, the rejection thereof has been obviated. With respect to claims 32-33, reconsideration and withdrawal of the rejection in light of the above is respectfully requested.

Claims 36-38 stand rejected under 35 U.S.C. §112, second paragraph on the grounds set forth on page 3 of the Official Action. This rejection is respectfully traversed.

While applicant traverses the grounds for rejection, claims 36 and 38 have been amended in a manner which is believed to address any concerns which may have prompted the above-noted grounds for rejection. Thus, reconsideration and withdrawal of the rejection is respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. §103

Claims 1-3, 10-11, 20-21 and 26-28 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,457,343 to Ajayan et al. (hereafter "*Ajayan et al.*") in view of U.S. Patent No. 5,698,175 to Hiura et al. (hereafter "*Hiura et al.*") on the grounds set forth on pages 4-5 of the Official Action. This rejection is respectfully traversed.

The present invention is directed primarily to techniques for introducing foreign species into nanotube-containing materials. More particularly, the techniques of the present invention address a need in the art by providing methods for reducing electronic work function of nanotube and nanoparticle materials, particularly with regard to the technique for intercalating electron donors such as alkali metals, or electron acceptors. The present invention provides a way of forming enclosed structures comprising a foreign species enveloped by a nanotube or nanoparticle material.

According to one aspect, a method performed consistent with the principles of the present invention is set forth in amended claim 1. Amended claim 1 recites:

> *1. A method of manufacture comprising:*
> *(a) producing raw nanostructure or nanotube-containing material comprising closed structures;*
> *(b) purifying the raw material;*
> *(c) processing the purified material thereby forming openings in the closed structures;*
> *(d) introducing a foreign species comprising electron donors or electron acceptors into at least some of the openings; and*
> *(e) closing the openings by forming passivation layers, thereby forming capsules filled with the foreign species.*

According to a further aspect, a method performed consistent with the principles of the present invention is embodied by claim 49. Claim 49 recites:

> *49. A method of reducing electronic work function, reducing threshold field emission values, converting semiconducting behavior to metallic behavior, increasing the electron density state at the Fermi level, and increasing electron emission site density, of carbon nanotube-containing material, the method comprising:*
> *(a) forming openings in the carbon nanotube-containing material;*
> *(b) introducing a foreign species comprising an alkali metal, an alkaline earth metal, a mixture of alkali metals, a mixture of alkaline earth metals, or a mixture or alkali and alkaline earth metals, into at least some of the openings; and*
> *(c) closing the openings by forming passivation layers, thereby forming carbon nanotube capsules filled with the foreign species.*

According to yet a further aspect, a method performed consistent with the principles of the present invention is set forth in claim 53. Claim 53 recites:

> *53. A method of manufacture comprising:*
> *(a) producing vertically oriented carbon nanotubes on a support surface;*
> *(b) applying an insulating layer;*
> *(c) opening tops of the nanotubes;*
> *(d) introducing a foreign species into the open tops and into interior spaces of the nanotubes;*
> *(e) closing the open tops of the nanotubes by forming passivation layers; and*
> *(f) activating the filled nanotubes.*

With regard to the grounds of rejection, claim 1 has been amended by the present response in a manner such that the substance of previous claim 31 has been incorporated therein. Since claim 31 has not been rejected over the above-mentioned combination, amended claim 1 is clearly distinguishable over *Ajayan et al.* in view of *Hiura et al.*

The remaining claims depend either directly or indirectly upon amended claim 1. Thus, these claims are also distinguishable over the above-mentioned combination.

Claims 4, 18-19, 35 and 52 stand rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1, and further in view of U.S. Patent No. 6,283,812 to Jin et al. (hereafter "*Jin et al.*") on the grounds set forth on page 5 of the Official Action. Claims 5 and 36-38 stand rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1, and further in view of U.S. Patent No. 5,951,832 to Tanaka et al. (hereafter "*Tanaka et al.*") on the grounds set forth on page 6 of the Official Action. Claim 6 stand rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1 and further in view of U.S. Patent No. 6,057,637 to Zettl et al. (hereafter "*Zettl et al.*") on the grounds set forth on page 6-7 of the Official Action. Claims 7-8 stand rejected under 35 U.S.C. §103(a) as being obvious *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1, and further in view of U.S. Patent No. 6,217,843 to Homyonfer et al. (hereafter "*Homyonfer et al.*") on the grounds set forth on page 7 of the Official Action. Claims 9 and 16 stand rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1, and further in view of the publication to Gao et al. entitled "Electrochemical intercalation of single-walled carbon nanotubes with lithium" (hereafter "*Gao et al.*") on the grounds set forth on pages 7-8 of the Official Action. Claim 12 stand rejected under 35 U.S.C. §103(a) as being unobvious over *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1, and further in view of U.S. Patent No. 5,641,466 to Ebbesen et al. (hereafter "*Ebbesen et al.*) on the grounds set forth

on page 8 of the Official Action. Claim 14 stands rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1, and further in view of *Ebbesen et al.* and U.S. Patent No. 6,413,487 to Resasco et al. (hereafter "*Resasco et al.*) on the grounds set forth on pages 8-9 of the Official Action.

As noted above, the substance of previous claim 31 has been incorporated into amended claim 1. Since claim 31 has not been rejected on the above-noted grounds, amended claim 1 is clearly distinguishable thereover. Thus, since the above-listed claims also depend from claim 1, these claims were also distinguishable for at least the same reason noted above.

Claims 15, 31-32 and 34 stand rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1, and further in view of the publication to Liu et al. entitled "Fullerene Pipes" (hereafter "*Liu et al.*") on the grounds set forth on pages 9-10 of the Official Action. This rejection is respectfully traversed. As indicated above, amended claim 1 includes the method step of "(e) closing the openings by forming passivation layers, thereby forming capsules filled with the foreign species."

In the grounds for rejection it is asserted that:

> Regarding claims 31-32, Ajayan teaches <u>any</u> method of closing the filled nanotubes known in the art. (emphasis added)

The above-quoted assertion is incorrect.

Contrary to the above-quoted assertion, *Ajayan et al.* does not disclose "any" method of closing filled nanotubes. In this regard, the pertinent teachings of *Ajayan et al.* read as follows:

> After completion of the introduction of the melted foreign material into the sinter hallow space of the carbon tubule, the broken top portion of the opening is restored and closed by the known process in the art. (emphasis added) (column 5, lines 62-65)

As evidenced by the above-quotation, *Ajayan et al.* suggests closing the carbon nanotube material described therein by restoring the surrounding carbon nanotube. By contrast, the presently claimed invention closes these openings by the formation of passivation layers, and not by restoring the ends of the nanotubes. For example, as described in paragraph [0057] of the present specification, the passivation layers can be formed via chemical reaction with the foreign species and does not require restoration of the nanotube to effect "closure"..

Thus, *Ajayan et al.* not only fails to disclose, or even suggest, each and every element recited by amended claim 1, it is in fact teaches away from the claimed invention. Namely, *Ajayan et al.* teaches an entirely different technique for closure of the filled nanotubes. Reconsideration and withdrawal of the rejection is respectfully requested.

Claim 17 stands rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1, and further in view of *Liu et al.* and *Jin et al.* Claims 22-25 stand rejected under 35 U.S.C. §103(a) as being obvious *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1, and further in view of U.S. Patent No. 6,090,363 to Green et al. (hereafter "*Green et al.*") on the grounds set forth on pages 10-11 of the Official Action. Claims 29-30 stand rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1, and further in view

of U.S. Patent No. 6,129,901 to Moskovits et al. (hereafter "*Moskovits et al.*") on the grounds set forth on page 11 of the Official Action.

As each of the above-mentioned grounds for rejection fail to include claim 31, and since amended claim 1 contains the substance thereof, none of the above-mentioned grounds for rejection render amended claim 1 obvious.

Claims 39, 40, 42 and 43 stand rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1, and further in view of U.S. Patent No. 6,417,606 to Nakamoto et al. (hereafter "*Nakamoto et al.*) on the grounds set forth on pages 11-12 of the Official Action.

This rejection is respectfully traversed.

First, as explained above, since amended claim 1 contains the substance of previously pending claim 31, and claim 31 has not been alleged as being obvious over the above-mentioned combination, amended claim 1 is clearly distinguishable thereover. Second, with respect to claim 42 (which has been rewritten in independent form as newly presented claim 71), the rejection is respectfully traversed.

Nakamoto et al. is directed to a field emission cathode device. In particular, *Nakamoto et al.* describes the use of a low work function layer (104). However, *Nakamoto et al.* fails to contain any disclosure whatsoever that would suggest that the layer 104 can be composed of nanostructure or nanotube capsules filled with a foreign species. Thus, the disclosure of *Nakamoto et al.* is not related to the methods described in *Ajayan et al.*, *Hiura et al.*, or for that matter the subject matter of claims 1 and 42. Thus, one of ordinary skill in the art would have had no objective reason for combining the teachings in

the manner suggested. Conversely, neither contained in the disclosures of *Ajayan et al.* or *Hiura et al.* fail to teach a work function on the order of that recited by claim 42.

To reiterate, one of ordinary skill in the art would not have sought to make the proposed combination. The rejection is improperly based upon a hindsight reconstruction of the prior art references. Moreover, while *Nakamoto et al.* may suggest that a low work function layer material formed of a number of granular or linear bodies, nothing in *Nakamoto et al.* would suggest a method which includes providing a nanostructure or nanotube-containing material filled with a foreign species with a work function on the order of that required by the presently claimed invention. Thus, reconsideration and withdrawal of the rejection is respectfully requested.

Claims 47-48 stand rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.* in view of *Hiura et al.* as applied to claim 1, and further in view of the publication to Lee et al. entitled "Conductivity enhancement in single-walled carbon nanotube bundles doped with K and Br" (hereafter "*Lee et al.*") on the grounds set forth on page 12 of the Official Action.

Since the above-mentioned grounds for rejection fails to assert that claim 31 would be rendered obvious in light thereof, and since claim 1 has been amended to include the substance of claim 31, amended claim 1 is clearly distinguishable over the above-noted grounds for rejection.

Claim 49 stands rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.* in view of *Green et al.* on the grounds set forth on pages 12-13 of the Official Action. This rejection is respectfully traversed.

As indicated above, claim 49 has been amended in a manner similar to that of claim 1. Thus, the method of claim 49 clearly requires the step of: "(c) closing the openings by forming passivation layers, thereby forming carbon nanotube capsules filled with the foreign species."

As explained above, *Ajayan et al.* fails to contain at least this aspect of the presently claimed invention. To the contrary, *Ajayan et al.* suggests an entirely different approach. Namely, *Ajayan et al.* suggests closure of the carbon nanotubes by rehabilitation and reconstruction of the carbon nanotube itself.

Green et al. is applied as allegedly teaching that the foreign species may include alkali metals, alkaline earth metals, and alloys in combinations thereof as the foreign species. However, even if the proposed combination were made, the claimed invention would not result. Thus, reconsideration and withdrawal of the rejection is respectfully requested.

Claim 50 stands rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.* in view of *Green et al.* as applied to claim 49, and further in view of *Gao et al.* on the grounds set forth on page 13 of the Official Action. Claim 51 stands rejected under 35 U.S.C. §103(a) as being obvious over *Ajayan et al.*, *Green et al.* and *Gao et al.* as applied to claim 50, and further in view of *Liu et al.* on the grounds set forth on pages 13-14 of the Official Action.

These claims depend upon claim 49. As explained above, neither *Ajayan et al.* nor *Green et al.*, taken alone or in combination, render the subject matter of amended claim 49 obvious. The addition of the teachings of *Gao et al.* and *Liu et al.* do not cure these

deficiencies. Thus, claims 50 and 51 are distinguishable over the proposed combinations for at least the same reasons noted above.

Claims 53-59 and 62 stand rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 6,283,812 to Jin et al. (hereafter "*Jin et al. '812*") in view of *Ajayan et al.*, and further in view of U.S. Patent No. 5,977,697 to *Jin et al.* (hereafter "*Jin et al. 697*") on the grounds set forth on pages 14-15 of the Official Action. This rejection is respectfully traversed.

As evident from the above, amended claim 53 clearly includes the step of: "(e) closing the open tops of the nanotubes by forming passivation layers; and ." The proposed combination fails to disclose, or even suggest, at least this aspect of amended claim 53.

As explained above, *Ajayan et al.* suggest a technique for closing carbon nanotubes which is distinct from that required by the presently claimed invention. Neither *Jin et al. '812* nor *Jin et al. '697* cure this deficiency. Thus, even if the proposed combination were made, the claimed invention would not result. Thus, reconsideration and withdrawal of the rejection is respectfully requested.

Claim 60 stands rejected under 35 U.S.C. §103(a) as being obvious over *Jin et al. '812* in view of *Ajayan et al.* and *Jin et al. '697*, as applied to claim 53, and further in view of U.S. Patent No. 6,129,901 to *Moskovits et al.* (hereafter "*Moskovits et al.*") on the grounds set forth on page 15 of the Official Action. Claim 61 stands rejected under 35 U.S.C. §103(a) as being obvious over *Jin et al. '812* in view of *Ajayan et al.* and *Jin et al. '697* as applied to claim 53, and further in view of *Liu et al.* on the grounds set forth on pages 15-16 of the Official Action. Claims 63-64 stand rejected under 35 U.S.C. §103(a)

as being obvious over *Ajayan et al.* in view of *Green et al.* as applied to claim 49, and further in view of *Jin et al. '812*.

These claims depend from either claim 49 or 53. The addition of the teachings of *Moskovits et al.*, *Liu et al.*, and *Jin et al. '812* do not cure the previously noted deficiencies of the principle combinations which form the basis for these grounds of rejection. Thus, these claims were also distinguishable over the applied prior art for at least the same reasons previously noted.

ALLOWABLE SUBJECT MATTER

Applicant notes with appreciation the indication that claims 13, 41 and 44-46 would be allowable if rewritten to overcome the rejections under 35 U.S.C. §112, and to include all of the limitations o the base claim and any intervening claims.

CONCLUSION

From the foregoing, further and favorable action in the form of a Notice of Allowance is earnestly solicited. Should the Examiner feel that any issues remain, it is requested that the undersigned be contacted so that any such issues may be adequately addressed and prosecution of the instant application expedited.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By: _____
Scott W. Cummings
Registration No. 41,567

P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620

Date: February 6, 2003

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Page 2, Paragraph [0008]

[0008] U.S. Patent No. 6,277,318 [_____ (Serial No. 09/376,457] entitled "Method for Fabrication of Patterned Carbon Nanotube Films"[),] the disclosure of which is incorporated herein by reference, in its entirety, discloses a method of fabricating adherent, patterned carbon nanotube films onto a substrate.

Page 3, Paragraph [0009]

[0009] U.S. Patent No. 6,334,939 [_____ (Serial No. 09/594,844] entitled "Nanostructure-Based High Energy Material and Method"[),] the disclosure of which is incorporated herein by reference, in its entirety, discloses a nanostructure alloy with alkali metal as one of the components. Such materials are described as being useful in certain battery applications.

Page 9, Paragraph [0041]

[0041] The process begins with raw nanoparticle or nanotube containing material, such as carbon nanotube-containing material 110. This raw nanotube material 110 can comprise at least one of single-walled carbon nanotubes and multi-walled carbon nanotubes. According to a preferred embodiment, the raw carbon nanotube-containing material 110 comprises single-walled carbon nanotubes. The raw carbon-containing material 110 can be fabricated according to a number of different techniques familiar to those in the art. For

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example, the raw carbon nanotube-containing material 110 can be fabricated by laser ablation techniques (e.g. - see U.S. Patent No. 6,280,697 [_____ (Serial No. 09/259,307)]), chemical vapor deposition techniques (see, e.g. - C. Bower et al., "Plasma Induced Conformal Alignment of Carbon Nanotubes on Curvatured Surfaces," Appl Phys Lett. Vol. 77, No. 6, pgs. 830-32 (2000)), the content of which is incorporated herein by reference in its entirety, or arc-discharge techniques (see, e.g. - C. Journet et al., Nature, Vol. 388, p. 756 (1997)).

Page 10, Paragraph [0047]

[0047] According to an alternative embodiment, the nanotubes are first processed by ion bombardment to create defects on the sidewalls of the nanotubes before being processed to form openings in the ends of the nanotubes. The defect density can be controlled by the processing time, intensity of the ion beam, and nature of the ion used. [IN] In the example of carbon nanotubes, ion bombardment causes breakage of the carbon bonds upon impact. After ion bombardment, the nanotubes are then further processed to form openings in the ends thereof, including milling or sonication in either alcohol or acid, as described above.

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Page 13, Paragraph [0053]

[0053] According to yet another embodiment, the intercalated species 130 may be introduced by an electrochemical reaction. Generally, this technique involves the discharge of ions of the intercalated species 130 from an electrode formed from the same material thereof which then travels from the electrode from which it is discharged and into the cut nanotube material 120. Upon reaching the cut nanotubes 120, a chemical reaction takes place, even at relatively low temperatures (see, e.g., - U.S. Patent No. 6,334,939 [_____ (Serial No. 09/594,884)]).

Page 14, Paragraph [0060]

[0060] After the nanostructure or nanotube material has reacted with the intercalated species and compound is produced that, in the embodiment where the material comprises carbon nanostructures or nanotubes, A_xC, where x [equals] is greater than 0 to 1, and A is the foreign species which comprises at least one of: Li, Na, K, Rb, Cs, Mg, Ca, Sr, Ba, Sc, Y, Fe, Co, Ni, Cu, or alloys thereof; a Lewis acid; halogen mixtures; metal chlorides; metal bromides; metal fluorides; metal oxyhalides; acidic oxides; and strong acids. The Lewis acid can comprise halogen Br_2, the acidic oxide can comprise N_2O_5 or SO_3, and the strong acid comprise HNO_3 or H_sSO_4.

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Marked-up Claims 1, 32, 33, 36-38, 49, 51-53 and 61

1. (Amended) A method of manufacture comprising:

(a) producing raw nanostructure or nanotube-containing material comprising closed structures;

(b) purifying the raw material;

(c) processing the purified material thereby forming openings in the closed structures;

(d) introducing a foreign species comprising electron donors or electron acceptors into at least some of the openings; and

(e) closing the openings by forming passivation layers, thereby forming capsules filled with the foreign species.

32. (Amended) The method of claim [31] 1, wherein the passivation layers are formed by dispersing the filled capsules in a solvent.

33. (Amended) The method of claim [31] 1, wherein the passivation layers are formed by exposing the filled capsules to oxygen or an oxygen-containing gas.

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Marked-up Claims 1, 32, 33, 36-38, 49, 51-53 and 61

36. (Amended) The method of claim 1, wherein the materials produced after step (d) have a chemical composition of A_xC where x [equals] is greater than 0 to 1, and A is the foreign species which comprises at least one of: Li, Na, K, Rb, Cs, Mg, Ca, Sr, Ba, Sc, Y, Fe, Co, Ni, Cu, or alloys thereof; a Lewis acid; halogen mixtures; metal chlorides; metal bromides; metal fluorides; metal oxyhalides; acidic oxides; and at least one of HNO_3 and H_2SO_4 [strong acids].

37. (Amended) The method of claim 36, wherein the materials produced after step (e) have a chemical composition of A_xC where x [equals] is greater than 0 to 1, and A is the foreign species which comprises at least one of: Li, Na, K, Rb, Cs, Mg, Ca, Sr, Ba, Sc, Y, Fe, Co, Ni, Cu, or alloys thereof; a Lewis acid; halogen mixtures; metal chlorides; metal bromides; metal fluorides; metal oxyhalides; acidic oxides; and at least one of HNO_3 and H_2SO_4 [strong acids].

38. (Amended) The method of claim 36, wherein the Lewis acid comprises halogen Br_2, and the acidic oxide comprises N_2O_5 or SO_3[, and the strong acid comprises HNO_3 or H_sSO_4].

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Marked-up Claims 1, 32, 33, 36-38, 49, 51-53 and 61

49. (Amended) A method of reducing electronic work function, reducing threshold field emission values, converting semiconducting behavior to metallic behavior, increasing the electron density state at the Fermi level, and increasing electron emission site density, of carbon nanotube-containing material, the method comprising:

(a) forming openings in the carbon nanotube-containing material;

(b) introducing a foreign species comprising an alkali metal, an alkaline earth metal, a mixture of alkali metals, a mixture of alkaline earth metals, or a mixture or alkali and alkaline earth metals, into at least some of the openings; and

(c) closing the openings by forming passivation layers, thereby forming carbon nanotube capsules filled with the foreign species.

51. (Amended) The method of claim 50, wherein step (c) comprises forming the passivation layers by dispersing the filled carbon nanotube-containing material in a solvent.

52. (Amended) The method of claim [1] 49, further comprising:

(d) forming a field-emitting flat panel display element comprising, at least in part, the capsules.

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Marked-up Claims 1, 32, 33, 36-38, 49, 51-53 and 61

53. (Amended) A method of manufacture comprising:

(a) producing vertically oriented carbon nanotubes on a support surface;

(b) applying an insulating layer;

(c) opening tops of the nanotubes;

(d) introducing a foreign species into the open tops and into interior spaces of the nanotubes;

(e) closing the open tops of the nanotubes by forming passivation layers; and

(f) activating the filled nanotubes.

61. (Amended) The method of claim 53, wherein step (e) comprises forming the passivation layers, thereby closing the open ends.